

**IN THE SPECIFICATION:**

Please amend the specification pursuant to 37 C.F.R. §1.121 as follows (see the accompanying "marked up" version pursuant to 1.121):

Page 3, delete the last full paragraph and insert the following new last paragraph:

A SkyCharger™ Node or "Node" is a computing device which contains programmed instructions and/or "intelligence" for monitoring communication traffic on a communications network such that when appropriate a reaction to commands received over the communications network occurs. The "Nodes" also broadcast commands and status

Page 4, delete the first paragraph and insert the following new first paragraph:

information to the network for the purpose of being monitored and/or responded to by other "Nodes" on the network. The "Nodes" provide a way to monitor, control, provide information to or from, or react to, information provided via SkyCharger™ network(s).

Page 4, delete the third paragraph and insert the following new third paragraph:

The SkyCharger™ system of the present invention eliminates disadvantages associated with the "Master Control" configuration of "tiered star" control system, and is a system which is inherently more flexible, reliable, and easy to use than conventional "tiered star" control systems.

Page 5, delete the second and third full paragraphs and insert the following new second and third full paragraphs:

---

B4  
Figure 1 is an exemplary illustration of the device in accordance with the invention installed in an aircraft seat. Shown therein are two passenger seats 101. SkyCharger™ system 102 is mounted in proximity to the passenger seats 101. The mounting configuration will depend on the specific requirements of an individual airline, and seat manufacturer, and is shown mounted in the middle of the seats in an exemplary location.

A SkyCharger™ Node or “Node” (in lower or capital case) is a computing device which contains programmed instructions and/or “intelligence” for monitoring communication traffic on a communications network such that when appropriate a reaction to commands received over the communications network occurs. The “Nodes” also broadcast commands and status information to the network for the purpose of being monitored and/or responded to by other “Nodes” on the network. The “Nodes” provide a way to monitor, control, provide information to or from, or react to, information provided via SkyCharger™ network(s).

---

B5  
Page 6, delete the third, fourth and fifth paragraphs and insert the following new third, fourth and fifth paragraph:

In further embodiments of the invention, the “Node” is connected to the communications network. Here, the “Node” can include additional control devices that receive commands from aircraft systems (such as the ARINC 429 system), or flight and/or maintenance personnel devices, and additional devices being controlled by the communications network, such as

*B*  
other in-flight entertainment systems, which are not specifically part of the SkyCharger™ system 102, but which are capable of appropriately reacting to commands issued by the SkyCharger™ system 102. The flight and/or maintenance personnel devices monitor power consumption of other systems located on-board the aircraft, such as the power drawn by galley(s) or other cabin equipment.

In another embodiment of the invention, the "Node" controls other devices, such as lights, bells, audio and/or video controls via either electro-mechanical or solid state relay devices, or analog or pulse width output controls. Alternatively, the "Node" introduces such external control commands into the Sky Charger™ system 102 by way of contact closures, external digital interface mechanisms, external digital communications devices (serial or parallel), or external analog input voltages, sensors, and the like.

In-flight entertainment video screen 103 receives power from the SkyCharger™ system 102. Passenger control 106 is implemented by way of a touch screen, or by a control panel located on an arm rest or center console of the passenger seat, or on the back of a front seat, or by a "control phone" located in the arm rest or center console of the passenger seat. These controls are implemented using membrane switch mechanisms, push buttons, toggle

---

Page 7, delete the entire page 7 and insert new page 7 as follows:

*B*  
switches, a touch sensitive display control integrated into, or separated from the in-flight entertainment system (I.F.E.), or by another appropriate human-machine interface mechanism. The SkyCharger™ Node computer(s) monitors the controls, transmits the passengers desired-action-information to the network for observation by all of the other "SkyCharger Nodes",

*B6  
B7*  
and decides the appropriate response to the passenger's request. In an embodiment of the invention, I.F.E. systems having an integrated touch screen are used to control the SkyCharger™ system 102 instead of the separate passenger control 106.

The SkyCharger™ Node also monitors the amount of power being consumed by the in-flight entertainment system 103, and uses this information as one element of a power control decision-making process. The SkyCharger™ system 102 also provides the power and controls for multiple seat motors 104. The actions of these motors are determined by the passenger via the passenger control panel 106, and via requests from the communications network when the seat position must over-ride the passengers personal request (such as when preparing for landing or during an emergency). The SkyCharger™ system 102 also monitors the amount of current being consumed as each seat motor 104 operates to provide current limiting during motor overloads, and when computing the amount of power used as part of the power control decision-making process.

The SkyCharger™ system 102 provides the power and the control to in-seat passenger reading lights 105 for activating and deactivating the reading lights. In an embodiment, the intensity of the passenger reading lights 105 is variable, and the light dimming functions are controlled via the passenger control panel 106. Here, the light dimming function can be over-ridden by the flight crew controls via the communication network. The SkyCharger™ system also monitors the amount of power being used by the lights for use as part of a power control decision-making process.

Cable 107 provides input power and system communications. This cabling provides the 115 VAC, 400 Hz input power for the operation of all SkyCharger™ system 102 functions. The input power is monitored by the SkyCharger™ system 102, and the amount of

Page 8, delete the entire page 8 and insert the following new page 8:

input AC power being consumed is a major factor in the power control decision-making process. The AC input power is also monitored by the SkyCharger™ system for short circuit conditions, and for ground fault paths. In this case, the SkyCharger Node™ can disconnect the input power from the input AC power to protect the wiring and aircraft from dangerous conditions, and to protect passengers from possible shock hazards. In an embodiment, cable 107 provides a “loop through” function, where the AC power enters the SkyCharger™ Node, and then loops out of the “Node” to the next “downstream” “Node(s)”. Cable 107 also provides a SkyCharger™ communications link via a multi-drop network. This communications link interconnects the in-seat power systems to form a “Peer to Peer” communications network, coupled with the decision-making process.

Figure 2 is an illustration of the device of Fig. 1 installed in an aircraft cabin utilizing a number of SkyCharger™ systems. SkyCharger™ System Gateway 201 provides an external interface mechanism into the SkyCharger™ Network. The “Gateway” 201 links to at least one Flight Attendant Control Panel (FACP) 202 via a bi-directional communications cable 203. The FACP 202 provides a mechanism for the cabin crew to enable and disable various system functions when units malfunction, or to disable a particular seat due to an unruly child or other passenger.

In an embodiment, an optional maintenance laptop computer 204, or other maintenance control is used for system status, diagnostics, and repair. This maintenance computer 204, or other control device is connected to the SkyCharger™ Gateway 201 via a bi-directional communications cable 205. The “Gateway” 201 also facilitates the connection of external contact

closures, external switches or relays 206, which perform system on/off functions when activated/deactivated by the flight crew. In an embodiment, the external closure functions are programmed upon system installation to suit the particular requirements of an airline and to perform a variety of control tasks.

“Peer-to-Peer” network 207 provides a way for each element within the SkyCharger™ system 102 to ascertain the available power levels, the amount of power being

Page 9, delete the first full paragraph and insert the following new first paragraph:

used, requests for further power, and system fault conditions. The “Peer-to-Peer” network 207 provides a “distributed intelligence” of the SkyCharger™ network which uses this commonly shared information and renders decisions on the utilization of the available aircraft power. The “Peer-to-Peer” network 207 also provides a way to monitor the power usage by a remote computer or control panel that is used to monitor the SkyCharger™ system 102 status, with respect to an individual seat’s current operations and possible fault conditions, the control of the system by flight crew or maintenance personnel, and the disablement of faulty “Node(s)” by the flight crew or maintenance personnel. The “Peer-to-Peer” network 207 also permits the SkyCharger™ system 102 to be programmed with respect to the available power on a particular aircraft, the required shutdown and fault conditions, the seat assignments and the functions available for a particular seat (or seating class). Using the Peer-to-Peer network, the SkyCharger™ system 102 develops a “personality” for a particular airline, aircraft, seating configuration, etc.

Page 9, delete the third paragraph and insert the following new third paragraph:

In addition to the control of individual SkyCharger™ systems by the flight crew or  
*B<sup>a</sup>* maintenance personnel, as indicated in items 202, 204, and 206, there are other control

Page 10, delete the entire page 10 and insert the following new page 10:

processes available that are implemented. In the preferred embodiment, primary process control is available to an individual passenger. This is made possible by way of passenger seat controls 106, 210, and possibly by way of 103 when a touch screen is installed. With these controls, passengers can move various seat motors 106, turn on and off the reading light(s) 105, adjust the reading light intensity, turn on and off the in-flight entertainment system 103, and turn on and off the in-seat power ports (not shown). These passenger controls either wire into the SkyCharger™ Node by a cable located in the seat. Alternatively, if the passenger controls are by way of the in-flight entertainment system touch screen panel, the control flows from the in-flight entertainment system communications network 211 to the SkyCharger™ Gateway 201. The “Gateway” subsequently provides a translation of commands generated by the in-flight entertainment system 103 and converts these commands into commands that are recognizable by the SkyCharger™ Network 207.

When the passenger requests a specific function, such as moving a seat back motor via a seat located pushbutton, the SkyCharger™ Node responsible for that seat compares the power required by the function with information concerning the available power. If the amount required is within a predetermined “power budget,” a local “Node” then immediately initiates the operation

of a motor, and broadcasts revised power consumption information to the network. As a result, response latencies between passenger requests and the time of the actual result are reduced, when compared to a remote “Master Control” type system.

Using commands received from an aircraft’s load management system via the ARINC 429 data bus **212**, the aircraft load management system computer (not shown) of the aircraft can provide the SkyCharger™ system **102** with information regarding available power from the aircraft’s generators, and can initiate emergency non-essential system shutdowns, such as shut down the SkyCharger™ units. In addition, flight crew controls can be linked into the SkyCharger™ network **207** via the ARINC 429 data bus **212** through this “Gateway” translation.

---

Page 11, delete the first and second full paragraphs and insert the following new first and second paragraphs:

Figure 3 is a schematic block diagram of electronic subsystems in an individual SkyCharger™ Node in accordance with the invention. Here, the various hardware elements in a typical SkyCharger™ Node are shown. It is to be understood that some versions of the SkyCharger™ Node are more complex, and others simpler. However, all SkyCharger™ Nodes possess a control microprocessor, a communications connection to the SkyCharger™ Network, and auxiliary devices, such as power supplies, sensors, etc.

The “Node” connects to the SkyCharger™ Network via communications transceiver and packet processor **301** which is used in a CAN or Ethernet environment to perform address recognition, error detection and correction, buffering, and the like. The input and output of

transceiver 301 are connected to the SkyCharger™ Node control processor 302. This processor provides the “intelligence” for the SkyCharger™ Node, receives commands from the SkyCharger™ Network, and broadcasts information to other “Nodes” on the network. Depending on the how the SkyCharger™ is configured, there may be more than one microprocessor in a given SkyCharger™ system. In a preferred embodiment, communication to the network is only by way of one microprocessor, which will then transmit messages to, or from the other microprocessors in the system. Accordingly, the term microprocessor(s) as used in the preferred embodiment may be more than one processor.

---

Page 12, delete the third, fourth and fifth paragraphs and insert the following new third, fourth and fifth paragraph:

*B<sup>12</sup>*

The solid state relays or “H bridges” 305 posses current and voltage rating that are sufficient to control external motor loads 306. These motors are located in the passenger seat 101 to actuate various seat functions, such as foot rests, head rests, seat lumbars up and down movements, etc. In preferred embodiments, there are up to 18 motors controlled by a single SkyCharger™ system 102. It is also to understood that a larger system can be constructed to include an even larger number of motors 306.

The power supply sections of the SkyCharger™ node comprise the majority of the additional items in Figure 3. The input power comes from the power systems of the aircraft, and is 115 VAC, 400 Hz 307. In an embodiment, it is possible to monitor the input power for overload

and/or ground fault conditions, where the power is disconnected from the input power during fault conditions.

In other embodiments, the input 115 VAC **307** can also be “looped thru **311**” to the next SkyCharger™ system. This loop thru also permits an individual SkyCharger™ system **101** to deny power to a “downstream” SkyCharger™ system should the overload and ground fault current sensor detect a short circuit, ground fault, or other fault condition. This capability to disconnect power is provided by a disconnect relay **310**. As a result, the safety monitoring of “downstream” devices is greatly enhanced and the system is protected from potentially dangerous shock, or fire hazards. The input power is also filtered by an

---

Page 13, delete the first, second and third paragraphs and insert the following new first, second and third paragraphs:

electromagnetic interference filter (E.M.I.) **308** that ensures that external noise sources do not enter the electronics of the SkyCharger™ system **101** and that no E.M.I. source within the SkyCharger™ system **101** is emitted from the unit to thereby enter the aircraft’s power system.

*B3*  
Power monitor and ground fault detector circuitry **309**, monitors the voltage and current of the input 115 VAC **307**, and whether any current is diverted from the intended return path (AC neutral) to the aircraft ground, which could indicate a hazardous short circuit condition, or human shock hazard. The output value from the power monitor and ground fault detector circuitry **309** is forwarded to the A/D convertor **303**, and “read” by the control microprocessor **302**. Relevant

"trip" values for ground faults and overload conditions are programmable by the SkyCharger™ Network **107**, **207**, and **301**.

The input 115 VAC, 400 Hz power is "Power Factor Corrected" by a Power Factor Corrector **312**, which reduces harmonic currents generated by various loads in the SkyCharger™ system **101**, and converts the input 115 VAC **307** into a high voltage DC buss **313**, which outputs a high DC voltage . In the preferred embodiment, the high DC voltage is approximately 250 VDC. This high DC is distributed to various power supplies **314**, **315**, **317**, and **319** for conversion into various voltage levels (discussed subsequently).

---

Page 14, delete the third, fourth, fifth and sixth paragraphs and insert the following new third, fourth, fifth and sixth paragraphs:

Motor power supply **319** provides power for operating the motors **306**, and also provides a DC voltage that is used by a power supply **320** to provide power for use by an in-flight entertainment system (I.F.E.) and a power supply **321** to provide power for local board electronics **321**. The actual arrangement of the power supplies depends on the specific application, with some systems of the preferred embodiment containing a greater number of power supply outputs, less power supply outputs, and differing output voltages.

With the above power supply arrangement, multiple power supplies can be controlled by way of the SkyCharger™ Node computer and via remote control through the SkyCharger™ Network.

Passenger seat controls and indicators **322** permit a passenger to control the seat motors, the lights, the I.F.E. on/off control, etc. These controls are typically a serial link to/from the

seat arm to the SkyCharger™ microprocessor 302. Using requests from the passenger seat controls and indicators 322, the SkyCharger™ microprocessor 302 “reads” the requirements of the passenger, and responds to specific requests after determining whether there is sufficient power to implement a specific request.

Power supply controls 323 provide the SkyCharger™ microprocessor 302 with a way to turn on/off the various power supplies when required. Preferably the digital control lines are used to activate various solid state or electro-mechanical relays for output controls.

In accordance with embodiments of the invention, a SkyCharger™ Peer-to-Peer system operates on a shared information – individual node decision process. The decision-making process relies on each SkyCharger™ system being programmed with specific

---

Page 15, delete the entire full paragraph and insert the following new entire page:

*B15*  
information upon system installation. The SkyCharger™ system then dynamically updates itself throughout normal day-to-day operations. Upon installation the system is initially programmed on a “Node” by “Node” basis. That is, each “Node” is provided with information concerning its seat assignment(s), what devices it will operate, what the current limits are for each device, and other “housekeeping” and safety information. Each SkyCharger™ Node is programmed with a unique identity, typically based on the seat assignment, or “Node” access ID. Likewise, the “Gateway” is programmed upon system installation, where its relevant parameters are translation functions for linking into an in-flight entertainment system, what input devices are available for the flight crew and maintenance personnel, and the like.

Through the “Gateway” the entire system is then programmed with aircraft specific information, such as the available power, the configuration of the in-flight entertainment system, the operating parameters of back lights of the in-flight entertainment system, the reading light characteristics, what specific units are on the network, and the like. This information is “read” by all SkyCharger™ Nodes on the system, and is stored in each “node” microprocessor’s local memory.

In certain embodiments, an actual “Gateway” may not be installed on the aircraft. Rather, a “Portable Gateway” unit would be temporarily connected to the SkyCharger™ Network for downloading the aircraft specific information into the SkyCharger™ for installation or maintenance purposes. A “Portable Gateway” would then be disconnected from the SkyCharger™ Network during normal flight operations. Here, the information from the “Portable Gateway” would also be stored in microprocessor memory of each local SkyCharger™ Node.

In embodiments of the SkyCharger™ system where a “Gateway” is not installed within the system, the network stills function from “Node” to “Node”, where power management is performed based on the stored aircraft configuration information. In such systems, access of the flight crew to the system controls is limited. Nevertheless, such a system can operate without any “Gateway”, based solely on the decision-making basis of the

---

Page 16, delete the second, third and fourth paragraphs and insert the following new second, third and fourth paragraphs:

---

In accordance with certain embodiments of the invention, an operational mode of the SkyCharger™ system is as follows: Upon initially receiving a “power on reset”, the system

“awakens”. The individual SkyCharger Nodes enter a system status “polling” state, where each “Node” sequentially announces its location and status. As each new “Node” “introduces” itself, all other devices listen to the “Node” introductions and stores the relevant information regarding each of the other “Nodes” in its local microprocessor memory. The “Gateway” also observes this activity and stores the information in its microprocessor(s) memory.

Once all of the “Nodes” on a system have announced themselves, they switch to a status reporting mode, which regularly and sequentially reports what devices are being used, and the current power consumption for each “Node”. The “Gateway” displays this information on flight crew and/or maintenance displays, and the other “Nodes” utilize this information to calculate the amount of remaining power. When a passenger turns on a switch, e.g., a light, the SkyCharger™ system for that seat then knows how much power is available from the aircraft, and decides whether that light can in fact turn on. If there is ample power in reserve, the SkyCharger™ system then immediately turns on the light.

If, however, there is an insufficient amount of power remaining, then an alternative process is used. Here, the SkyCharger™ of a local seat which requires the power will then request additional power from the network. The decision to grant more power is based on the class of the seat (first class having higher priority), the nature of the load being requested (seat motors are short term, transient loads, which can quickly end), and whether that seat has been a nuisance, such as due to a child playing with the controls. In embodiments of

---

Page 17, delete the second, third, fourth and fifth paragraphs and insert the following new second, third, fourth and fifth paragraphs as follows:

In another embodiment, the SkyCharger™ power management system possess the ability to “listen” to the ARINC 429 bus of the aircraft main power management unit, where the SkyCharger™ system dynamically adjusts the power available according to the power reserves that the aircraft power management unit reports for the cabin power.

In a further embodiment, the SkyCharger™ Node is a galley power monitor which is also connected to the SkyCharger™ Network. In accordance with the present embodiment, this Galley Power Monitor Node reports when heavy power usage in the galleys exists, such as during the preparation of a meal, and when there is a slight power usage in the galley. Here, the SkyCharger™ system can increment or decrement the amount of power allotted for use by the passengers based on this information. By being able to share the power utilization information throughout the SkyCharger™ system, and each node then being able to make dynamic decisions based on changing information, the SkyCharger™ system is able to constantly adjust the usage of the available power for maximum efficiency and passenger convenience.

To manage power in a sudden very high demand situation, such as preparing powered seats for landing, the skyCharger™ network allots power in a sequential order based on the class of the seats, and the power required. Each SkyCharger™ is aware of its location, and therefore its priority. In the case of an emergency the flight crew can activate an emergency shut down. The SkyCharger™ system will then deactivate all unnecessary functions, immediately return all powered seats to the upright condition, and then lock out all passenger power request capabilities, until the

emergency condition is cleared. As a result, a cabin can be quickly and safely prepare for an emergency landing, and the like.

In addition to constant power monitoring, the SkyCharger™ system also performs another safety function. That is, the SkyCharger™ system constantly monitors the

Page 18, delete the first and second paragraphs and insert the following new first and second paragraphs as follows:

system for ground faults, overloads, over-temperatures, and short circuit conditions.

If a dangerous condition is detected by a SkyCharger™ Node that "Node" will immediately disconnect the fault, and if necessary disconnect the downstream 115 VAC input power loop-thru, thus denying power to a potentially faulty unit. As a result, maximum safety to the passengers and to the aircraft's electrical system is provided.

In accordance with embodiments of the invention, the SkyCharger™ also possesses the ability to monitor the ground fault current for each "Node" and to adjust the safety limits to dynamically balance the system for different loading conditions. As a result, passenger safety is maximized, while at the same time the number of nuisance ground fault trips is minimized. If an individual SkyCharger™ microprocessor malfunctions, built in circuitry in each SkyCharger™ Node automatically disconnects the faulty "Node" from the network such that an individual unit cannot cause other units to malfunction. As a result, the reliability of the SkyCharger™ system is further enhanced.

Page 18, delete the last paragraph and insert the following new last paragraph as follows:

---

Within the SkyCharger™ system of the present invention, each “Node” on the system network has the ability to make control decisions based on commonly shared information. These decisions permit rapid response times to passenger requests for seat functions, without the delays inherent in a “Master Control” based system. These decisions maximize usage of a limited resource (aircraft power) and permit utilization of that resource in an efficient manner. All of the “Nodes” on the “SkyCharger” network are aware of their peers, and “know” what their priority is, based on their cabin locations, with first class possessing the highest priority, and coach possessing the lowest.

Each “Node” therefore

Page 19, delete the second and third paragraphs and insert the following second and third new paragraphs as follows:

---

In the presence of low power levels, numerous methods are available for the system’s use to gain additional power for additional power requests. In accordance with the exemplary embodiments, when additional power is not available, then new requests are ignored until additional power becomes available. The SkyCharger™ system also permits external information to be introduced into the SkyCharger™ network via a “Gateway” system, which permits maintenance and flight crew personnel to control and monitor the system. The SkyCharger™ system can also receive control commands from some in-flight entertainment systems that is translated by the “Gateway” and broadcast through the [“SkyCharger Network.”] SkyCharger™ Network.